Chapter 6 Problem Set

1. Rank the following photons in terms of increasing energy:
2. blue (A = 453 nm); (b) red (A = 660 nm); (c) yellow (A =595 nm).
3. Which of these electron transitions correspond to absorption of energy and which to emission?

(a) n = 2 to n = 4 (b) n = 3 to n = 1

(c) n = 5 to n = 2 (d) n = 3 to n = 4

1. Arrange the following H atom electron transitions in order of increasing frequency of the photon absorbed or emitted:

(a) n = 2 to n = 4 (b) n = 2 to n = 1 (c) n = 2 to n = 5 (d) n = 4 to n = 3

1. How many orbitals in an atom can have each of the following designations:
2. I s; (b) 4d; (c) 3p; (d) n = 3?
3. For each of the fol lowing, give the sublevel designation, the allowable ml values, and the number of orbitals:
4. n = 4, *l* = 2 (b) n = 5 , *l* =1 (c) n = 6, *l*= 3
5. As space exploration increases, means of communication with humans and probes on other planets are being developed.

(a) How much time (in s) does it take for a radio wave of frequency 8.93 x107 S-1 to reach Mars, which is 8.l x 107 km from Earth?

(b) If it takes this radiation 1 .2 s to reach the Moon, how far (in m) is the Moon from Earth?

1. Enormous numbers of microwave photons are needed to warm macroscopic samples of matter. A portion of soup containing 252 g of water is heated in a microwave oven from 20.°C to 98°C, with radiation of wavelength 1.55 x 10-2 m. How many photons are absorbed by the water in the soup?
2. Use the Rydberg equation to calculate the wavelength (in nm) of the photon emitted when a hydrogen atom undergoes a transition from n = 5 to n =2.
3. For each of the following sublevels, give the *n* and *l* values and the number of orbitals: (a) 5s; (b) 3p; (c) 4f
4. Write a full set of quantum numbers (*n, l, ml, ms*) for the following:

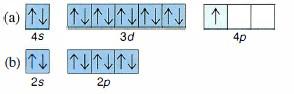
(a) The outermost electron in an Rb atom

(b) The electron gained when an S- ion becomes an S2- ion

(c) The electron lost when an Ag atom ionizes

(d) The electron gained when an F- ion forms from an F atom

1. Write the full ground-state electron configuration for each:
2. Rb (b) Ge (c) Ar (d) Br (e) Mg (f) Se
3. From each partial (valence-level) orbital diagram, write the ground-state electron configuration and group number:



1. How many inner, outer, and valence electrons are present in an atom of each of the following elements?
2. O (b) Sn (c) Ca (d) Fe (e) Se
3. Identify each element below, and give the symbols of the other elements in its group:

(a) [He] 2s22p1 (b) [Ne] 3s23p4 (c) [Xe] 6s25d1

1. Arrange each set in order of increasing atomic size:
2. Rb, K, Cs (b) C, O, Be (c) CI, K, S (d) Mg, K, Ca
3. Arrange each set of atoms i n order of increasing IE ,
4. Sr, Ca, Ba (b) N , B , Ne (c) Br, Rb, Se (d) As, Sb, Sn
5. Write the charge and full ground-state electron configuration of the monatomic ion most l i kely to be formed by each:
6. Cl (b) Na (c) Ca
7. Palladium (Pd; Z = 46) is diamagnetic. Draw partial orbital diagrams to show which of the fol lowing electron configurations is consistent with this fact:

(a) [Kr] 5s24d8 (b) [Kr] 4d10 (c) [Kr] 5s14d9